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On the significance of leg laterality in everyday movement and in sport

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It is not just in everyday life that we tend to show a preference for one side of the body; what is known as laterality is often demonstrated in sport too. The significance of such laterality is discussed particularly in relation to injuries (Brophy et al 2010, Chalmers et al 2017, Jordan et al 2015). An essential aspect of any sporting activity, whether in popular sport or top-class sport, is staying healthy and preventing serious injury. Muscles and tendons do not always adapt evenly to sporting stresses. The resulting imbalances and accompanying laterality increase the risk of injury (Fuller et al 2017). Assessing leg symmetry is part of a functional approach to the analysis of this dominance of one side of the body.

The Limb Symmetry Index - a Risk Factor for Injury

Balanced left-right distribution is a key pre-requisite for good quality of movement and hence for preventing injury. Unilateral tests are used to determine the limb symmetry index (LSI). This quantifies the percentage deviation of the left-right comparison of the lower limbs and is calculated using the following formula: $LSI = (\text{value for the non-dominant leg} / \text{value of the dominant leg}) \times 100$. In this context, laterality is described as dominance of one leg and, associated with this, a motor and sensory preference. Based on existing literature, a left-right difference of 10% - 15% is deemed to be physiological so that an LSI of at least 85% should be achieved (McGrath et al 2016). Scientific studies show that deviations of over 15% are associated with an increased risk of injury (Impellizzeri et al 2007, Bishop et al 2017). These asymmetries therefore need to be identified early on in training, whether in leisure or elite sport, and countered with suitable training programmes. An LSI $\geq 85\%$ is also a basic criterion for clinically assessing whether it is safe to return to sport after injuries such as an ACL rupture or ankle injury (Lynch et al 2015).

Many types of leisure sport, e.g. alpine skiing/tennis/soccer/etc., place heavy demands on sport-specific motor performance. Frequent changes of direction, the influence of external factors and rapid actions at high speed require the most even possible relationship between the two sides of the body in order to maintain balance in any situation. A current study into the influence of the LSI as a risk factor for injuries in young downhill skiers showed that large differences in leg strength and unilateral dominances in bounce correlated significantly with an increased risk of injury (Steidl-Müller et al. 2018). Yet it is not just leg strength and bounce that play a key role, but also evenly-balanced sensorimotor control and, associated with this, an aligned co-ordination of movement.

Specific training to reduce laterality

The muscles acting on the joints need to stabilise the degree of freedom of the joints to take advantage of synergies in muscle activation. Only a symmetrical and balanced interaction between the structures involved can ensure a stable posture and therefore a more specific execution of movement. In this context, a stable posture means dynamic balance, and specific training to achieve this under

unilateral conditions is needed too. The newly-developed Challenge Disc test and training app based on scientific norms now also includes a single-leg co-ordination test with single-leg training tailored to focus on training the weaker side. A current pilot study also refers to the correlation between training-related fatigue and the increased effect of training laterality (Leister et al 2018). It is therefore also worth performing single-leg co-ordination training under pre-fatigue conditions created by training to make training on the Challenge Disc more effective. Training on the Challenge Disc is not only fun but at the same time has a positive effect on avoiding laterality in everyday life or during sporting activities - try it out!

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